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PHOTOMETRIC OBSERVATION OF NS MONOCEROTIS

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NS Mon = CSV 783 = BD+7°1367 (9.5) was discovered by Hoffmeister (1934). He classified the variable as possibly Algol type in the range between $10^{\rm m}_{.}5$ and $11^{\rm m}$(pg). First investigation of this variable was performed by Kippenhahn (1955) based on 87 plates. He found the maximum brightness not to be constant, suspected β Lyr–type and gave three times of minimum light. Three additional minima timings were submitted by Wasiljanowskaja (1954). She supposed the variable to be of Algol type. Variability of the star between $10^{\rm m}_{.}8$ and $11^{\rm m}_{.}3$ (pg) was confirmed by Weber (1956). An investigation on 320 photographic plates by Olijnyk (1963) resulted in 15 times of minimum light of NS Mon but the elements could not be found. An even larger set of photographic plates was used by Häussler (1978). He investigated this star on 501 plates of the Sonneberg and Hartha Sky Patrols and derived first elements:

$$\mathrm{Min\,I} = \mathrm{HJD}\,2441599.600\ +\ 0^{\rm d}_{.}9399163 \times \mathrm{E}. \qquad (1)$$

Using the estimates on the Sonneberg plates together with the above elements a first photographic lightcurve and an O–C diagram were given. Unfortunately two weak stars north and south of NS Mon led to a rather large scatter in the lightcurve. NS Mon was classified as W UMa type in the range between $10^{\rm m}_{.}64$ and $11^{\rm m}_{.}08$ (ph). With these above data NS Mon is listed in the fourth edition of the GCVS (Kholopov et al. 1985).

For seventeen years the variable had remained obviously unobserved when we put NS Mon on our program, scheduled to look after seldom observed or in some other way problematic eclipsing binaries.

The photoelectric observations were made at the private observatory of one of us (F.A.) with a 0.35 m automatic photoelectric telescope (Agerer 1988). The photometer was equipped with an uncooled EMI 9781A tube and Schott filters for B and V. SAO 114137 (G5) was used as comparison star and SAO 114096 (G0) to check its constancy.

One minimum was observed photographically (P.F.) with a Lichtenknecker Flatfield-Camera f=576mm, f/D=2.0 on hypered KODAK Technical Pan 2415. The exposures were evaluated with a fixed diaphragm photometer. Altogether one new photographic and 10 photoelectric minima in two colours could be collected. All minima times were calculated with the Kwee – van Woerden (1956) method.

In compiling the lightcurve (Figure 1) from our data it became evident that the period published in the GCVS was a spurious one with the relation

$$\frac{1}{\mathrm{P_{GCVS}}} - \frac{1}{\mathrm{P}} = \frac{1}{2}.$$

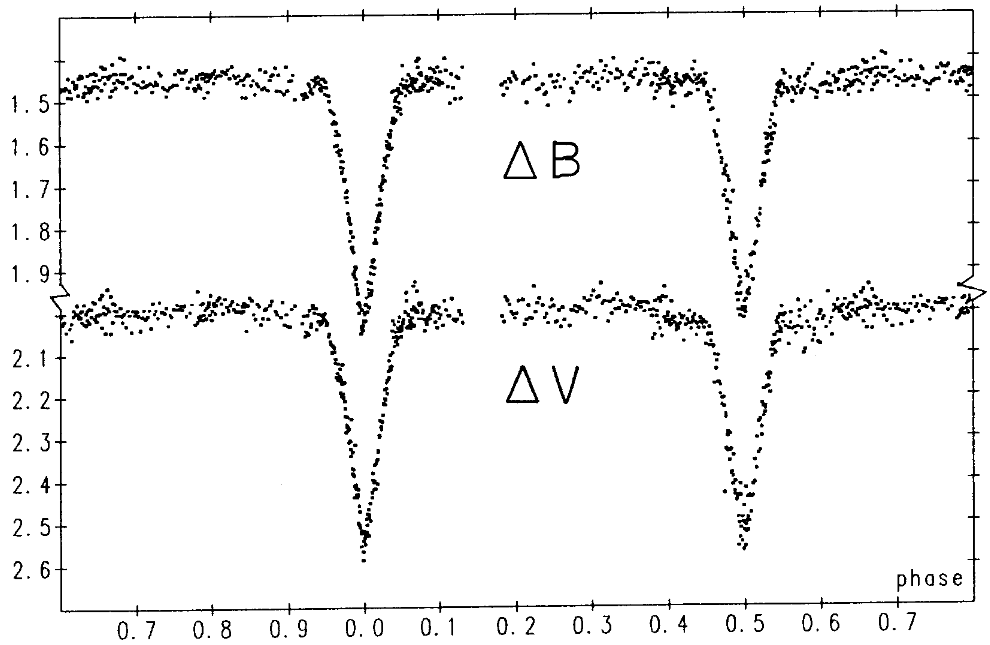

Figure 1: Differential light curves in B and V of NS Mon computed with respect to the new ephemeris (2).

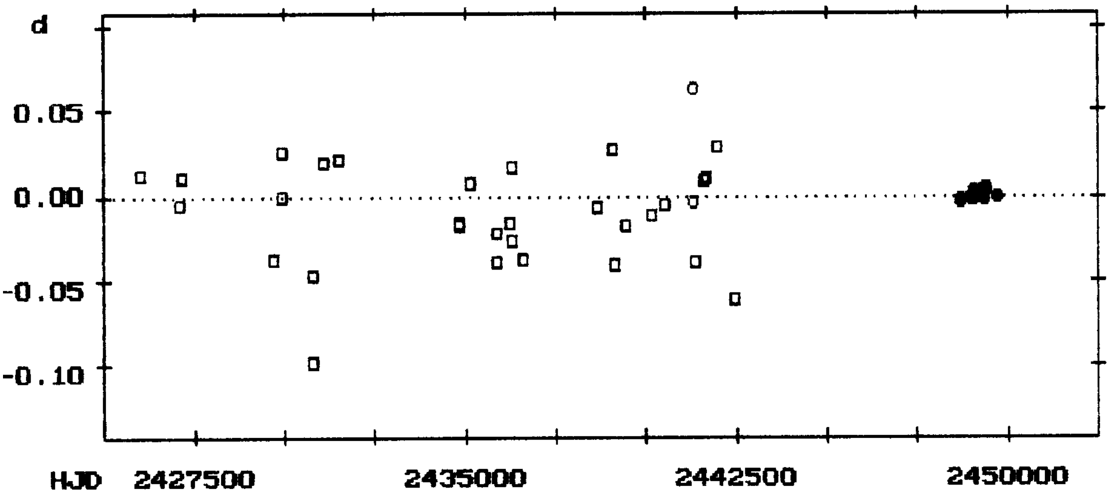

Figure 2: O–C diagram for NS Mon computed with respect to the new ephemeris (2) using all available minimum timings. • represents photoelectric, ∘ photographic series and ▫ photographic plate minima.

Using all published minima found in the 'BAV Database of Minima of Eclipsing Binaries' together with our new observations, a weighted least squares fit yields the following linear ephemeris:

$$\begin{array}{ll} \mathrm{Min\,I} = \mathrm{HJD}\,2449002.4539 + 1\overset{d}{.}77761517 \times \mathrm{E} & \\ \phantom{\mathrm{Min\,I} = \mathrm{HJD}\,24490}\pm 4 \qquad\qquad \pm 17 & \end{array} \qquad (2)$$

Our observations show the primary and secondary minima to be almost equally deep with an amplitude of $0\overset{m}{.}54$. A distinction between them was not possible. If both minima are primary ones, the period has to be halved. As can be seen from the lightcurve, NS Mon is in any case of the type EA.

Table 1

Observed times of minima for NS Mon, epochs and residuals computed with respect to the ephemeris (2) derived in this paper.

N	JD hel. 2400000+	W	T*	Epoch	O–C	Lit	N	JD hel. 2400000+	W	T*	Epoch	O–C	Lit
1	26030.345	2	P	−12923.0	+0.012	[1]	29	41330.330	20	F	−4316.0	+0.063	[4]
2	27100.452	2	P	−12321.0	−0.005	[1]	30	41385.334	2	P	−4285.0	−0.039	[4]
3	27157.352	2	P	−12289.0	+0.011	[1]	31	41599.585	2	P	−4165.5	+0.009	[4]
4	29700.182	2	P	−10859.5	−0.038	[2]	32	41680.468	2	P	−4119.0	+0.011	[4]
5	29913.533	2	P	−10739.5	−0.000	[3]	33	41983.569	2	P	−3949.5	+0.029	[4]
6	29913.559	2	P	−10739.5	+0.026	[3]	34	42448.326	2	P	−3687.0	−0.061	[4]
7	30762.298	2	P	−10261.0	−0.047	[3]	35	48690.4786	60	V	−176.5	−0.0038	[5]
8	30768.469	2	P	−10258.5	−0.097	[3]	36	48690.4805	60	B	−176.5	−0.0019	[5]
9	31090.335	2	P	−10077.5	+0.020	[3]	37	48985.5648	60	V	−10.5	−0.0018	[5]
10	31531.184	2	P	−9829.5	+0.021	[2]	38	48985.5654	60	B	−10.5	−0.0012	[5]
11	31903.145	0	P::	−9619.0	−0.429	[2]	39	48986.4537	60	B	−9.0	−0.0017	[5]
12	34807.290	2	P	−7986.5	−0.018	[3]	40	48986.4541	60	V	− 9.0	−0.0013	[5]
13	34823.291	2	P	−7977.5	−0.015	[3]	41	49002.4527	60	B	0.0	−0.0012	[5]
14	35135.285	2	P	−7801.0	+0.007	[3]	42	49002.4532	60	V	0.0	−0.0007	[5]
15	35862.283	2	P	−7392.0	−0.040	[3]	43	49018.451	30	B:	9.0	−0.001	[5]
16	35870.300	2	P	−7388.5	−0.022	[3]	44	49018.454	30	V:	9.0	+0.002	[5]
17	36194.329	0	P::	−7205.0	−0.408	[3]	45	49059.3379	60	B	32.0	+0.0003	[5]
18	36230.273	2	P	−7185.0	−0.016	[3]	46	49059.3380	60	V	32.0	+0.0004	[5]
19	36278.301	2	P	−7158.0	+0.016	[3]	47	49067.340	20	F	36.5	+0.003	[6]
20	36286.257	2	P	−7154.5	−0.027	[3]	48	49370.419	30	V:	207.0	−0.001	[5]
21	36613.327	2	P	−6970.5	−0.038	[3]	49	49370.419	30	B:	207.0	−0.001	[5]
22	38673.614	2	P	−5811.5	−0.007	[4]	50	49371.310	30	V:	207.5	+0.001	[5]
23	39057.613	2	P	−5595.5	+0.027	[4]	51	49371.313	30	B:	207.5	+0.004	[5]
24	39146.426	2	P	−5545.5	−0.041	[4]	52	49402.420	30	V:	225.0	+0.003	[5]
25	39441.534	2	P	−5379.5	−0.017	[4]	53	49402.421	30	B:	225.0	+0.004	[5]
26	40152.585	2	P	−4979.5	−0.012	[4]	54	49688.6123	60	V	386.0	−0.0011	[5]
27	40504.560	2	P	−4781.5	−0.005	[4]	55	49688.6126	60	B	386.0	−0.0008	[5]
28	41329.375	20	F	−4317.5	−0.003	[4]							

[1]: Kippenhahn (1955), [2]: Wasiljanowskaja (1955), [3]: Olijnyk (1963), [4]: Häussler (1978), [5]: Agerer: this paper, [6]: Frank: this paper.

*) P denotes pg plate min., V photoelectric min. in visual and B in B Filter and F photographic series. Those marked with ':' got reduced weight while those marked with '::' were discarded.

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